REMARKS

Applicants hereby confirm the election to continue prosecution of Group I, Claims 1 - 33, which was made during a telephone conversation between Examiner Thomas Parson and the undersigned attorney of record on October 7, 2002, and which was previously confirmed in applicants' Amendment "A", filed November 14, 2003.

However, applicants maintain (as contended in Amendment "A") that the Examiner's reason for the restriction requirement is in need of correction. Applicants agree that the claims in Class I (Claims 1 - 33) are drawn to an electrochemically roughened aluminum or aluminum alloy surface. Applicants agree that the claims in Class II (Claims 34 - 45) are drawn to a method of electrochemically roughening an aluminum or aluminum alloy surface. Applicants do not agree that the product made by the electrochemical roughening process can be made by a bead blasting process. In fact, applicants specifically teach that a surface which is bead blasted exhibits a sharp, jagged appearance when magnified. Applicants' schematic drawing shown in Figure 2 is an illustration taken from a photomicrograph of a bead blasted aluminum alloy surface. As can be seen from Figure 2, a bead blasted surface exhibits rough tips which can curl over, forming hook-shaped projections 202 which can break off or entrap particles 204 including the bead blast particle itself. "As a result, the bead blasting media may act as a source of contamination of the aluminum surface." "Further, the sharp surface provided by bead blasting may complicate a subsequent anodization process"(Application Specification, paragraph 0009.) Applicants developed the electrochemical roughening method described and claimed in the present application to avoid the problems which are created by bead blasting the aluminum surface to roughen the surface so that a protective coating layer can better adhere to the surface. Applicants' method of electrochemically roughening an aluminum or aluminum alloy surface provides a surface which has the appearance of rolling hills and valleys when magnified (as shown in Figure 3). Applicants do not know of another method which can be used to produce the surface of rolling hills and valleys, but in any case, applicants are claiming a roughened

surface which is prepared by electrochemical treatment, since this is the only roughening method they found which would produce the kind of surface desired.

Applicants' attorney agreed to the restriction requirement, in which independent Claim 34 (and claims which depend therefrom) are restricted out of the present prosecution, because the method for electrochemically roughening a surface comprising aluminum or an aluminum alloy, as claimed in Claim 34, may have application in the surface preparation of other materials which are different from aluminum or an aluminum alloy (not because applicants know of any other method to obtain the roughened surface exhibiting the rounded hills and valleys).

Applicants have amended the Specification to clarify the meaning of Paragraphs 26 and 27, by correcting oversights which are readily apparent to one skilled in the art reading the application. No new matter has been added by these amendments to the Specification. In particular, in Paragraph 26, "μm" has been added to the Ra description. That μm is the correct unit indication is readily apparent in view of the discussion in Paragraph 27 which follows, where all of the dimensions presented are in μm. In Paragraph 27, the reference numbers for the hills and valleys which are shown on Figure 3 are added to the Specification.

Claim Rejections Under 35 USC § 112

Claims 2, 3, 13, 14, 15, and 26 are rejected under 35 USC § 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. In particular, the Examiner states that the rejected claims recite a surface roughness range, but that the unit of measurement for surface roughness is unclear.

Initially applicants' attorney thought that the Examiner was indicating that the units Ra were not generally known. Subsequently, applicants' attorney realized that the Examiner wanted the addition of the recitation μm in combination with Ra. With this in mind, applicants' attorney believes the Examiner is referring to Claims 2, 3, 13, 14, 25 and 26. All of these claims have

dependent claims where values are presented in μm, but this recitation is missing in the cited claims. These claims have been amended to include the recitation of μm. Applicants thank the Examiner for pointing out this oversight.

In light of the general recognition and use of the Ra roughness unit for purposes of describing surface characteristics, and the addition of the μm recitation, applicants respectfully request withdrawal of the rejection of Claims 2, 3, 13, 14, 15, and 26 under 35 USC § 112, second paragraph.

Claim Rejections Under 35 USC § 102

Claims 1, 7, 9 - 12, 18, 20 - 22, 24, and 30 are rejected under 35 USC § 102(b) as being anticipated by U.S. Patent No. 6,063,203, to Satoh ("the Satoh reference").

Applicants respectfully contend that the Satoh reference does not anticipate applicants' claimed invention. The Satoh reference teaches the use of additional steps in a roughening process, which additional steps are not required by applicants. Further, a portion of the additional steps taught in the Satoh reference affect the surface of the substrate in a manner which is harmful to the performance of semiconductor equipment fabricated using the Satoh method. The final, roughened surface formed by the Satoh method is illustrated in the Satoh Fig. 2C. It is readily apparent that the raised portions of the surface structure exhibit sharp corners which serve as stress risers. By comparison, the roughened surface obtained when applicants' method is used is illustrated in applicants' Figure 3. There are no corners which can serve as stress risers. The Satoh reference teaches away from applicants' invention by teaching a combination of steps which does not produce the roughened surface obtained by applicants.

In more detail, the Satoh reference pertains to a susceptor for plasma CVD equipment, and a process for producing the susceptor. The surface of the susceptor is roughened by a process comprising a step of mechanically flattening the surface of the susceptor; a step of shot-blasting the surface of the flattened susceptor; and a step of polishing the shot-blasted surface of

the susceptor chemically, electrochemically, and/or mechanically. A steep protrusion is removed from the surface of the susceptor, and the resulting susceptor surface is said to have an Ra value in which $1\mu m \leq Ra \leq 8\mu m$. (Abstract) However, stress riser structures remain on the roughened surface created by the Satoh method.

Applicants teach away from the use of bead blasting or shot blasting as a means of roughening an aluminum surface for use within a semiconductor processing chamber. Applicants have instead developed a method of electrochemically roughening a previously unroughened aluminum-comprising surface, which method provides a surface which does not entrap particles, is free from jagged and hooked surface formations, and can be coated with an anodized layer or other protective layer without the concern that stress risers beneath the anodized layer surface will cause such protective layer to crack. Prior to the present invention, such protective layers (coatings) cracked in the manner shown in applicants' Figure 1. Applicants have demonstrated that their electrochemically roughened aluminum surface relieves stress in an anodized finish subsequently produced over the roughened surface, so that the anodized layer does not crack upon thermal cycling up to about 300°C. (Page 3, line 23, through page 4, line 1, of applicants' Specification)

In the "Response to Arguments" section of the present Office Action, the Examiner states: "Applicant has argued that the Satoh reference requires additional surface preparation steps which applicants teach are harmful, and forms a surface which is different from the surface formed and claimed by applicants, and neither teaches nor suggests applicants' presently claimed invention. However, the claim does not preclude additional surface preparation steps."

There is nothing in applicants' disclosure which indicates that the surface which is being roughened was previously roughened by any other technique. Applicants begin their processing with an aluminum alloy as received from the alloy producer or machinist. For example, at Page 7, paragraph 26, applicants begin with unroughened, machined aluminum or aluminum alloy. To make it clear that the method claimed is for roughening of a previously unroughened

aluminum surface, applicants independent Claims 1, 12, and 24 have been amended, as set forth above, to recite that a previously unroughened aluminum or aluminum alloy surface is being roughened.

Applicants teach the disadvantages of a bead blasting step of the kind employed in the Satoh method. As discussed in the "Background Art" section of applicant's specification, at Page 2, line 21, through Page 3, line 5, "Typically, aluminum semiconductor chamber surfaces have been roughened by bead blasting. However, bead blasting often is a manual process, in which it is difficult to control the uniformity and repeatability. Further, bead blasting typically provides a very sharp, jagged surface 200 on the aluminum, as shown in Figure 2. Tips of the roughened aluminum can curl over, forming hook-shaped projections 202 which can break off or entrap particles 204, including the bead blast particle itself. As a result, the bead blasting media may act as a source of contamination of the aluminum surface. Bead blasting is not useful as a roughening method for some of the softer aluminum alloys, such as the 1000 series, because the bead blasting particles can easily become embedded in the ductile metal. Further, the sharp surface provided by bead blasting may complicate a subsequent anodization process." Apparently the inventor in the Satoh patent considered bead blasting to be necessary. Applicants were able to obtain a very useful roughened surface while avoiding the bead blasting process.

In light of the amendments to applicants' independent Claims 1, 12, and 24, applicants contend that the Satoh reference does not read on applicants' claimed invention and in fact, teaches away from applicants' claimed invention.

In the "Response to Arguments" section, the Examiner also states: "Moreover, Figure 2C demonstrates an electrochemically roughened surface having the appearance of rolling hills and valleys when magnified. Additionally, as seen in Figure 2C sharp protrusions are eliminated from the chamber's surface . . ." However, Figures 2A - 2C and the accompanying description at Col. 4, lines 3 - 11, of the Satoh reference, indicates that the rolling hills and valleys of applicants' roughened surface are not achieved. Figure 2B illustrates the surface after shot

blasting, and Figure 2C illustrates the surface after subsequent polishing to remove the sharp protrusions at the upper surface of Figure 2B. Looking at the schematic in Figure 2C, one can see that the sharp protrusions have been flattened off, but that there are still corners on the flattened plateaus which act as stress risers. None of the Satoh schematics show the rolling hills and valleys which appeared on applicants photomicrographs and which are illustrated in applicants' Fig. 3. Applicants' roughened surface provides no sharp corners which can act as stress risers under a coating applied over the roughened surface.

In light of the above distinctions, applicants respectfully request withdrawal of the rejection of Claims 1, 4, 7, 9 - 12, 15, 18, 20 - 22, 24, 27, and 30 under 35 USC § 102(b), over Satoh.

Claim Rejections Under 35 USC § 103

Claims 2, 3, 5, 6, 13, 14, 16, 17, 25, 26, 28, and 29 are rejected under 35 USC § 103(a) as being unpatentable over Satoh.

The deficiencies of the disclosure of Satoh with respect to the patentability of the presently claimed invention are discussed in detail above. Applicants maintain that Claims 2, 3, 5, 6, 13, 14, 16, 17, 25, 26, 28, and 29 (all of which depend from Claim 1) are patentable over the disclosure of Satoh for the same reasons presented above with respect to the rejection of applicants' claims over Satoh. The fact that the Satoh reference teaches away from applicants' method in terms of the steps which are carried out in the method, and the difference in the appearance of the roughened surfaced produced by the Satoh method supports applicants' contention that applicants' invention is not taught or even suggested by the Satoh reference, and is not obvious over this reference.

In light of the above distinctions, applicants respectfully request withdrawal of the rejection of Claims 2, 3, 5, 6, 13, 14, 16, 17, 25, 26, 28, and 29 under 35 USC § 103(a), over Satoh.

Claims 8, 19, 23, and 31 - 33 are rejected under 35 USC § 103(a) as being unpatentable over Satoh, in view of U.S. Patent No. 6,007,673, to Kugo et al. ("the Kugo reference").

The deficiencies of the disclosure of Satoh with respect to the patentability of the presently claimed invention are discussed in detail above.

The Kugo et al. reference discloses roughening the bottom surface of a quartz top plate which is placed on the bottom electrode of a semiconductor processing chamber. Roughening of the bottom surface of the quartz top plate is performed in order to enhance the adhesion between the quartz top plate and deposits resulting from a dry etching process. (Abstract) At Col. 6, lines 65 - 66, Kugo et al. teaches the use of sand blasting or grinding with coarse abrasive grains to effect roughening of the surface to the desired surface roughness. The surface of the quartz top plate 1 is illustrated in Figure 1 and shows sharp points at the upper surface, of the kind observed by applicants when bead blasting is carried out on an aluminum surface. This is precisely this kind of surface applicants seek to avoid.

As previously discussed, applicants' method produces a surface exhibiting rounded, rolling hills and valleys upon magnification; this kind of surface avoids stress cracking of coatings which are applied over the surface. In the case of byproducts which adhere to the roughened surface of the semiconducting process chamber, or the roughened surface of a processing component in the chamber, the goal is to have the byproducts remain firmly attached to the roughened surface until wet cleaning or plasma cleaning of the chamber and component surfaces. To avoid cracking of a coating of byproduct material, it is advantageous not to have stress risers present in the underlying roughened surface. This avoidance of cracking of a layer of byproduct reduces the chance of particulate formation which is harmful to the yield of acceptable product produced in the process chamber. Applicants' invention is an improvement over the invention described in Kugo et al. reference. There is nothing in the Kugo et al. reference that even suggests applicants' invention.

Since the Satoh reference teaches away from the formation of applicants' roughened surface and the Kugo et al. reference does not even suggest applicants' roughened surface, a combination of these references does not lead one skilled in the art in the direction of applicants' invention and does not motivate one skilled in the art to work toward applicants' invention.

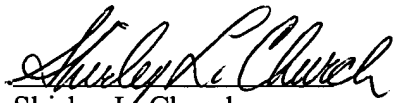
Whether taken alone or in combination, neither Satoh nor Kugo et al. teaches or even suggests applicants' claimed invention. In light of the above distinctions, applicants respectfully request withdrawal of the rejection of Claims 8, 19, 23, and 31 - 33 under 35 USC § 103(a), over Satoh, in view of Kugo et al.

The cancellation of claims withdrawn under the restriction requirement, and the amendment of claims to more clearly recite the invention and to remove any indefiniteness, all place the claims in better condition for allowance or for appeal, and the Examiner is respectfully requested to enter the amendments requested herein.

Applicants respectfully contend that the presently pending claims as amended are in condition for allowance, and the Examiner is respectfully requested to enter the present amendment and to pass the application to allowance.

The Examiner is invited to contact applicants' attorney with any questions or suggestions, at the telephone number provided below.

Respectfully Submitted,



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